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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/581,345	Applicant(s) SATOU ET AL.
	Examiner Fatou Gisele Maiga	Art Unit 1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06-02-07*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06-02-07*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 1 recites the limitation "at least one pair of adjacent ones among the plurality..." in the second paragraph. There is insufficient antecedent basis for this limitation in the claim. What are the ones?

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-6 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wynne et al. US Patent No. 6, 207,312 and further in view of Cargneli US PGPub. 200300008194.

With respect to claim 1, Wynne discloses a self-humidifying polymer electrolyte membrane (PEM) comprising a membrane electrode assembly (MEA, 10). The MEA

includes a polymer electrolyte (PEM, 12), electrodes attached to porous electrically-conductive gas diffusion backings (14, 16), a plurality of current collector layers or flow fields (20, 22, made of porous graphite fiber paper or cloth) distributing fuel and oxidant to the electrodes, gas supply channels (fig. 1, elements 34, 36) formed (on current collectors) between the current collectors and the attached electrode-gas diffusion backing layers, a multiple of gas supply branch flow passages (fig. 1; 34, 36) branching form the gas supply flow channels (fig. 3; 31, 30), a plurality of gas exhaust flow channels (fig. 1; 36, 44) carrying the flow to the current collector layers to be disregarded.

Wynne further discloses that multiple of fuel cell assemblies can be positioned in series to form a fuel cell stack (col. 4, lines 61-62), with individual cells separated and electrically connected to each other through separators for providing electrical path for electrons (col. 6, lines 7-10).

Wynne fails to use a solid polymer electrode membrane in the membrane electrolyte assembly.

Cargneli discloses manifolds for a fuel cell system and recites that the structural components/manifolds can be used in any type of fuel cell (page 3, paragraph 0055).

Therefore, it is known in the art that the structural components of a fuel cell does not depend on the type of fuel cell. The fuel cells in the fuel cell stack can be any type of fuel cell such as proton exchange membrane fuel cells, solid oxide fuel cells, direct methanol fuel cells, etc, as evidenced in Cargneli.

It would have been obvious to one of ordinary skill in the art at the time of the invention when claiming structural components/manifolds to use any type polymer electrolyte as did Wynne as taught in Cargneli since the structural components of a fuel cell does not depend on the type of fuel cell.

With respect to claim 2, the electrodes are attached to a porous electrically conductive gas diffusion backing layers (col. 1, lines 20-26) formed on each side of the electrolyte.

With respect to claim 3, the current collector layers (22, 20) are disposed adjacent to the electrodes (fig. 1, 13, 15).

With respect to claim 4, the gas supply channels extend from the inlet port (30) on the flow field plates (20, 22) to reach the electrodes (col. 4, lines 63-65 and col. 5, lines 1-10).

With respect to claim 5, the current collector layer are fabricated from electrically conductive material such graphite (col. 2, line 1), which can be porous as in graphite fiber paper or cloth.

With respect to claim 6, the current collector layers have gas flow channels carrying the flow. The flows are forced to flow through the pores of the gas diffusion layers to the adjacent electrodes (col. 5, lines 1-10).

With respect to claim 16, electrodes include a catalyst, such as platinum or platinum supported on carbon, for inducing desired electrochemical reactions. The catalyst can be attached to the diffusion backings (fig 1, 14, 16), and the backings subsequently pressed against the membrane (12).

Membrane electrode assembly (10) is interposed between porous, electrically-conductive gas diffusion backings (14) and (16) carrying the catalyst and facing the fuel and oxidant flow field plates (20) and (22).

With the interdigitated channels employing forced convection of the reactant through the diffusion layer, forcing the reactant closer to the catalyst layer and this results in more rapid reactant flow through the diffusion layer and back to the flow fields. With the current collectors and diffusion layers electrically attached, the current collectors also carry the catalyst layer (col. 4, lines 43-54; col. 5, lines 1-18).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 7, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wynne and Cargneli as applied to claim 1 above, and further in view of Enami US Patent 5,922,485.

With respect to claims 7 and 8, modified Wynne discloses a fuel cell with first current collector layers, but fails to include second current layers to the fuel stack.

Enami discloses a fuel cell stack comprising first and second current collector layers/separators (col. 4, lines 31-35), with the separators containing fuel gas outlets.

It is known in the art to incorporate multiple separators to the fuel cell to enhance flow distribution by attributing each separator with specific flow to specific electrode.

The separators (first and second, col. 6, lines 13-16) in this case have inlets on their periphery to convey fuel, gas or coolant to the electrodes and outlets at their central portion to exit the exhaust fuel (claim 8; col. 4, lines 40-45).

It would have been obvious to one ordinary skill in the art at the time of the invention to incorporate second electrode layers to the design of Wynne as taught by Enami to have greater distribution system.

With respect to claim 10, modified Wynne in his disclosure fails to show the cross sectional area of exhaust gas flow channels in the outer peripheral larger than those in the central area.

Enami in his disclosure shows in figures (1a, 1b, 2a, and 2b) that the cross sectional area of exhaust gas flow channels in the outer periphery are larger than those in the central area. According to Enami, the cell temperature should decrease in the downstream direction but increase in the vicinity of the gas outlets (contrary to conventional fuel cell, col. 3, lines 2-19).

Therefore, with the higher temperature near the reactant gas outlets (fig. 2A, elements 1 and 5), moisture in the reactant gases will not condense around such outlets, thus increasing the power generating efficiency of the unit cell.

It would have been obvious to one ordinary skill in the art at the time of invention to make the exhaust gas flow channels in the outer periphery larger than those in the central area in the design of Wynne as taught by Enami for an increase power efficient of the unit cell.

It is know in the art that exhaust gases from the electrochemical reaction tend to blow out to the outside area and flow around the outer periphery area. Therefore increasing the surface area of gas exhaust flow channels around the periphery help dissipate these gases, which increase the power efficiency of the unit cell.

It would have been obvious to one ordinary skill in the art at the time of the invention to increase the surface area of exhaust gas flow channels around the outer periphery than those in the central area in the design of Wynne as taught by Enami for an increase power efficient of the unit cell.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wynne and Cargneli as applied to claim 1 above, and further in view of Chen Patent 6,274,258.

With respect to claim 9, modified Wynne in his disclosure fails to show the number of exhaust gas flow channels in the outer peripheral larger than those in the central area.

Chen in similar disclosure shows in figure (5) an increase number of exhaust gas flow channels at the outer periphery than in the central area of the separator/ interconnector plates (44).

It is known in the art that exhaust gases from the electrochemical reaction tend to blow out to the outside area and flow around the outer periphery area. Therefore increasing the number of gas exhaust flow channels around the outer periphery help dissipate gas, which increases the power efficiency of the unit cell.

It would have been obvious to one ordinary skill in the art at the time of the invention to increase the number of exhaust gas flow channels around the outer periphery than those in the central area in the design of Wynne as taught by Chen for an increase power efficient of the unit cell.

8. Claims 11, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wynne and Cargneli as applied to claim 1 above, in view of Enami and further in view of Edlund US PGPub. 20030219639.

With respect to claims 11 and 12, Wynne illustrates first current collector made of porous electric current conductors (page 2, line 1 and fig. 2, element 22, made of porous material such as graphite fiber or carbon paper or cloth) containing openings (44, 46), from which the gas supply flow channels are branched off.

Wynne fails to cover the openings with a metal frame section and to make the openings at the outer periphery area larger than the central area.

Emani in his disclosure shows outer periphery openings (fig. 1a, elements 1, 3, 5) larger than those in the center (fig. 1a, 2, 4, 6).

It is obvious to increase the openings at the outer surface since the flow channels are larger to contain large flow of reactants for the electrochemical reaction, than the openings/outlet in center used to release exhaust of gas (remaining from chemical reaction).

Modified Wynne fails to show metal frame section to cover the openings

Edlund discloses a layer bipolar plate for fuel cell with a structural metal/ metal frame section (fig. 6, 98) connected to a conductive layer (fig. 6, 104) etched to form openings (fig. 6, 110), from which flow channels are branched off (fig. 6, 87).

According to Edlund structural metal provides strength to the bipolar plate assembly.

It would have been obvious to one ordinary skill in the art at the time of the invention to incorporate a metal frame section to the design of Wynne as taught by Edlund to provide strength to the bipolar plates assembly.

With respect to claim 13, the width in which the frame section overlaps the electric conductor is greater than the thickness of the electric conductor in the stack direction (fig. 6).

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wynne and Cargneli as applied to claim 1 above, in view of Hartvigsen et al. US Patent 6,224,993 and further in view of Batawi et al. US Patent 5, 932, 368.

With respect to claim 14, Wynne illustrates first current collector but fails to disclose third current collector layers with greater pore size.

Hartvigsen illustrates in his preferred embodiment of a solid oxide fuel cell, third electrode plate or current collector layer on opposite side of the electrolyte plate (page 2, lines 36-46).

According to Hartvigsen, because of the plurality of current collector layers or support members, the electrodes do not need to function as the primary support member, thus, the electrolyte supports are unaffected by oxygen potentials incompatible with the electrode materials (col. 4, lines 44-47).

It would have been obvious to one ordinary skill in the art at the time of invention to provide third current collector layers to the design of Wynne as taught by Hartvigsen in order to provide more support to the electrolyte plate.

Wynne modified by Cargneli and Hartvigsen fails to mention that the third electrode layer has pore size greater than the first current collector layer.

Batawi discloses a high temperature fuel cell (abstract), wherein the electrolyte and electrodes layers are placed on highly porous base layer (80-300 microns) and fine pore cover layer of pore size (1-3 microns) for increase transport of ions and heat dissipations across the fuel stack.

It would have been obvious to one ordinary skill in the art at the time of invention to provide third current collector layer with large pore size to the design of Wynne as taught by Batawi in order to increase transport of ions between the electrode and dissipation of heat across the fuel stack.

10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wynne, Cargneli and Enami as applied to claim 7 above, in view of Hartvigsen et al. US Patent 6,224,993 and further in view of Batawi el al. US Patent 5,932,368.

With respect to claim 15, Modified Wynne illustrates second current collector layers, but fails to disclose third current collector layers with greater pore size.

Hartvigsen illustrates in his preferred embodiment of a solid oxide fuel cell, third electrode plate or current collector layer on opposite side of the electrolyte plate (page 2, lines 36-46).

According to Hartvigsen, because of the plurality of current collector layers or support members, the electrodes do not need to function as the primary support member, thus, the electrolyte supports are unaffected by oxygen potentials incompatible with the electrode materials (col. 4, lines 44-47).

It would have been obvious to one ordinary skill in the art at the time of invention to provide third current collector layers to the design of Wynne as taught by Hartvigsen in order to provide more support to the electrolyte plate.

Wynne modified by Cargneli, Enami and Hartvigsen fails to mention that the third electrode layer has pore size greater than the second current collector layer.

Batawi discloses a high temperature fuel cell, wherein the electrolyte and electrodes layers are placed on highly porous base layer (80-300 microns) and fine pore cover layer of pore size (1-3 microns) for increase transport of ions and heat dissipations across the fuel stack.

It would have been obvious to one ordinary skill in the art at the time of invention to provide third current collector layer with large pore size to the design of Wynne as taught by Batawi in order to increase transport of ions between the electrode and dissipation of heat across the fuel stack.

Conclusion:

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fatou Gisele Maiga whose telephone number is (571) 272-9804. The examiner can normally be reached on Monday-Friday 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FM

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SUPERVISORY PATENT EXAMINER